

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Guns for Atomization and Electrostatic Projection of Particles

- We, SOCIETE ANONYME DE MACHINES ELECTROSTATIQUES, a French Body Corporate of 21 Rue Jean-Mace, Grenoble (Isere) France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- The present invention relates to guns, particularly for hand use, for the atomization and electrostatic projection of liquids for the purpose of covering objects, for example with paint.
- Apparatus of this kind is known comprising a rotating electrostatic head, made of conducting, high resistivity or insulating material, in various shapes, in which centrifugal force combines with the electrostatic forces arising between the head and the object to be covered in order to atomize the paint and to project the resulting fine particles on to the object.
- The present invention consists in a gun for the atomization and electrostatic deposition of fine particles of a coating material on to an object to be covered, comprising a head to which a high potential is applied and including a movable element which is reciprocally vibrated by means of a generator of mechanical vibrations, wherein the head is hollow and comprises two wall members which progressively converge towards one another and form between their adjacent ends an opening with resilient edges through which coating material supplied to the interior of the head is fed in a discontinuous and periodic manner by means of the reciprocating vibrations of the movable element, whereby atomization of the coating material is produced by the combination of the mechanical vibrations and electrostatic forces.
- In order more clearly to explain the technical characteristics and the advantages of the invention, several embodiments of guns for electrostatic painting will now be described, by way of example, with reference to the accompanying drawings, in which:—
- Figure 1 is a longitudinal axial section of a gun according to the invention, the outlet orifice of the electrostatic head being closed.
- Figure 2 is a section of the extremity of the head showing the outlet orifice open.
- Figure 3 is a plan view of the electrostatic head of Figure 1.
- Figure 4 is a section, similar to that of Figure 1, of a modification, and
- Figure 5 shows a modification of the liquid-tight joint between the electrostatic head and the control rod of insulating material.
- Referring to Figure 1, it will be seen that the gun comprises a metallic handle 1 to which is fixed, in any appropriate manner, an elongated insulating body 2. Into the handle extend
- (a) a pipe 3 of insulating material for the supply of paint under pressure. This pipe opens into the interior of the hollow part of the electrostatic head 4, fixed to the end of the insulating body 2.
- (b) a high tension cable 5 which is connected to the head 4 by means of a protective electric resistance 6 of which the value can be several tens of megohms, for example about 50 megohms, and
- (c) a low tension cable 7 which is connected to a vibrator 8 which will be described below.
- The handle 1 also comprises a trigger 9, operable by the user and associated with a control rod 10 for separating a valve 11 which can be progressively opened and which is inserted in the paint supply pipe 3. The control rod 10 also actuates an electric switch 12 connected in the cable 7 supplying current to the vibrator 8. This vibrator, disposed in the rear part of the handle 1, comprises a coil 13 fed with alternating current, for example mains current, by the cable 7, a plunger core 14, preferably of mutually insulated magnetic sheets or of an agglomerated magnetic material.

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such as ferrite, and a restoring spring 15 fixed at one of its ends to the end of the vibrator housing and at its other end to the plunger core 14. The latter is extended by a control rod 16 of insulating material having at its end a thin metallic blade 17. The rod 16 passes into the head 4 through an opening in the base of the head 4 provided with a gland 18 which is adjusted by a screw 19 to be liquid-tight while permitting longitudinal displacements of the rod 16.

The electrostatic head 4, of metal or of high resistivity material, is formed by two flat wall members or lips 20 forming therebetween at their free bevelled ends a straight passage 21 into which the blade 17 can be inserted in order to close it. To this end the thickness of the blade 17 is slightly greater than the distance which separates, in the absence of constraints, the two slightly resilient lips 20.

The arrangement of these parts is such that, in the position of rest, the passage 21 is closed.

The operation of the device is as follows:—

The high tension being applied to the cable 5, the operator presses on the trigger 9 in order to allow the material to be atomized to be supplied to the head 4 through the pipe 3, and in order to close the circuit of the vibrator 8.

The core 14 of this latter produces a reciprocating longitudinal movement of the rod 16 and the blade 17 in such a manner that this latter closes the passage 21 (Figure 1) and opens it (Figure 2) successively at the frequency at which the vibrator 8 oscillates. There is thus produced the desired discontinuous and periodic supply of atomized particles towards the object (not shown) to be covered.

In the modification of Figure 4, similar parts to those in Figure 1 bear the same reference numerals. This modification concerns the means for driving the rod 16. In place of the vibrator 8 a small electric motor 22 is used which actuates the rod 16 through the medium of an appropriate eccentric 23. The motor is fed through the low tension cable 7. The operation of the device is the same as described with reference to the previous embodiment.

In the two embodiments which have been described, it will be seen that the control rod 16 penetrates into the head 4 through a gland 18. It is quite evident that this gland can be replaced by any other equivalent device. For example, as shown in Figure 5, a bellows device 25 can be used fixed at one end to the rear of the head 4 and at its other end to a collar 26 fixed to the control rod 16 and forming a tight joint with it. The bellows 25 can itself be replaced by any equivalent flexible device; for example a flexible diaphragm of metal or other elastic material.

In the embodiments described, the electrostatic head has been vibrated at a relatively

low frequency, namely that of the electric mains supply network. For some applications, or in order to atomize some products, it may be advantageous to use higher frequencies, for example those in the audible frequency spectrum or even ultrasonic frequencies. The member which vibrates the head must, obviously, be adapted to the frequency being used. Thus for example, in the field of ultrasonics, where the invention has interesting applications, the vibrator could be a piezo-electric or magnetostrictive device of an appropriate type.

WHAT WE CLAIM IS:—

1. A gun for the atomization and electrostatic deposition of fine particles of a coating material on to an object to be covered, comprising a head to which a high potential is applied and including a movable element which is reciprocally vibrated by means of a generator of mechanical vibrations, wherein the head is hollow and comprises two wall members which progressively converge towards one another and form between their adjacent ends an opening with resilient edges through which coating material supplied to the interior of the head is fed in a discontinuous and periodic manner by means of the reciprocating vibrations of the movable element, whereby atomization of the coating material is produced by the combination of the mechanical vibrations and electrostatic forces.

2. A gun according to claim 1, wherein an electrically insulating control rod is connected at one of its ends to the generator of mechanical vibrations and carries at its other end the movable element in the form of a thin blade of a thickness at least equal to that of the said opening, said blade alternately opening and closing said opening under the action of the said generator.

3. A gun as claimed in claim 2, in which the generator of mechanical vibrations is an electromagnetic vibrator having a movable core attached to said one end of the control rod.

4. A gun according to claim 3, wherein a restoring spring is associated with the core of the electromagnetic vibrator such that, when the coil of the vibrator is not energised, the thin blade is moved by the spring into the said opening in order to close it.

5. A gun as claimed in claim 2, in which the generator of mechanical vibrations comprises an electric motor which drives an eccentric device connected to said one end of the control rod.

6. A gun according to claim 2, wherein the control rod passes into the head through a gland.

7. A gun according to claim 2, wherein a flexible device, for example a bellows, is fixed in a liquid-tight manner between the head and the control rod.

8. A gun according to claim 1 or 2, wherein the generator of mechanical vibrations operates at an ultrasonic frequency.

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9. A gun according to claim 1 or 2, wherein the generator of mechanical vibrations comprises a piezo-electric or magnetostrictive device.
- 5 10. Guns for the atomization and electrostatic projection of coating materials, constructed as hereinbefore described with reference to the accompanying drawings.

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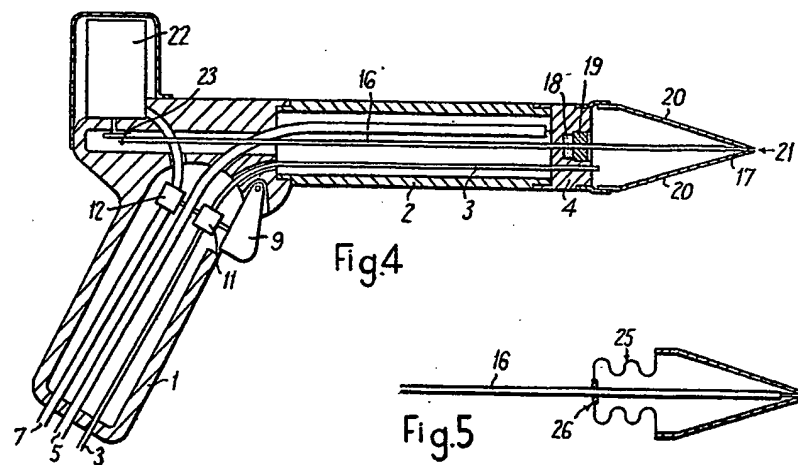
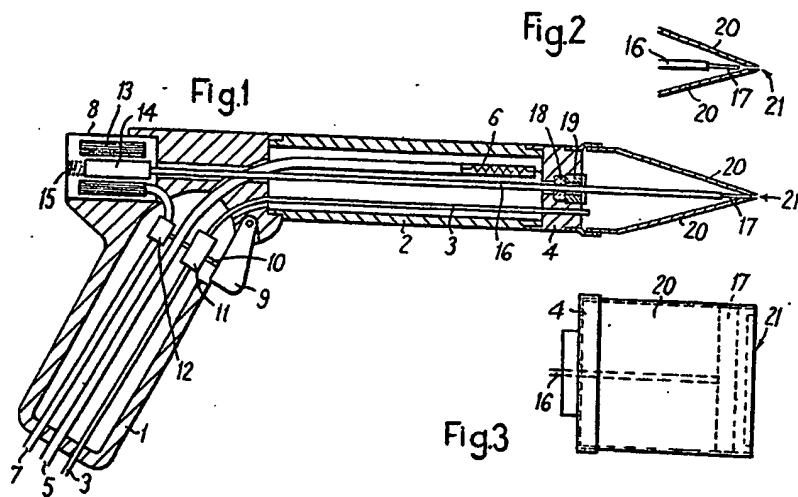
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1 SHEET

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the Original on a reduced scale



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